# Operationalizing Sustainable Development: Positive Case Studies to Benefit People and the Planet

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## Introduction

The COVID-19 pandemic and overlapping global crises, including geopolitical conflict and climate change, have made achievement of the United Nations Sustainable Development Goals (SDGs) more challenging. The scientific community increasingly recognizes the need to accelerate the adoption of evidence-based, scientifically-sound policies and actions to operationalize sustainable development; however, stakeholders lack a shared understanding of how the 17 SDGs can be operationalized. Despite the high degree of interest in the types of activities included in the SDGs, recognition of the SDGs is low in some countries, including the United States (Morning Consult and United Nations Foundation, 2021). Positive case studies can help to provide a shared understanding of how the 17 SDGs can be operationalized.

In November 2022, the U.S. National Academies of Sciences, Engineering, and Medicine released a short consensus report, *Operationalizing Sustainable Development to Benefit People and the Planet* that identifies key research priorities and possible actionable steps to operationalize sustainable development (NASEM, 2022). Common areas across the eight themes discussed in the report include: (1) the need for additional data and reporting; (2) the need for multi-stakeholder, multi-sectoral collaboration and the importance of participatory processes in decision-making; and (3) the need for targeted financing at multiple levels from the international to the community scale. Relating to the key focus areas of the International Conference on Sustainable Development, this article highlights forward-looking assessments from some of the positive case studies in the report, including decarbonization, urbanization, food systems, and science, technology, and innovation (STI) for the SDGs (Table 1). As we approach the midpoint to implement the SDGs, broad engagement and commitment from governments, the private sector, funders, and civil society are needed to achieve the SDGs.

**Table 1** Four Themes and Their Key Relevant SDGs

| Themes in This Article | Key Relevant SDGs |
|---|---|
| Decarbonization | Goals 3 (good health and well-being), 7 (affordable and clean energy), 13 (climate action), 15 (life on land), and 17 (partnerships for the goals) |
| Urbanization | Goals 3 (good health and well-being), 10 (reduced inequalities), 11 (sustainable cities and communities), and 13 (climate action) |
| Food Systems | Goals 1 (no poverty), 2 (zero hunger), 3 (good health and well-being), 6 (clean water), 10 (reduced inequalities), 12 (responsible consumption and production), 13 (climate action), 14 (life below water), and 15 (life on land) |
| Science, Technology, and Innovation for the SDGs | Goals 9 (industry, innovation, and infrastructure), 12 (responsible consumption and production), and 17 (partnerships for the goals) |

## Decarbonization: Framework for Carbon Sequestration Certification

Decarbonization of energy systems is central to global decarbonization efforts and achievement of all SDGs. The Intergovernmental Panel on Climate Change's Sixth Assessment (AR6) has identified the need to permanently sequester about 10 percent of current carbon emissions by 2050 to stay within the Paris temperature limits: that is, the sequestration of 6–10 gigatons/year by 2030 or sooner (IPCC, 2022). Carbon dioxide removal (CDR) technologies capture carbon either directly from the air or at a fossil-fuel source, then reuse or sequester it depending on the method. Both engineered and nature-based methods are at different stages of research, development, and deployment, including direct air capture, mineralization, soils, forests, bioenergy with carbon capture, and ocean sequestration (Burns, 2022). However, CDR technologies are in the early stages of development, their unintended consequences are not known, and they require massive scale-up and financial investment to meet the AR6 goal.

One promising initiative is certification of carbon removal and sequestration that can help ensure safety, performance, and trust among stakeholders. The role of certification is to provide direct (buyers) and indirect (public) assurance that a product, service, or person meets certain claims (Arcusa, 2022). Arizona State University (ASU), Thunderbird School of Global Management, and Conservation International have been involved in a multistakeholder collaborative project to develop a framework for carbon sequestration certification. There are more than 30 standards organizations and over 125 standards for 23 types of activities to sequester carbon; however, current certification and standards are inconsistent and incomplete (Arcusa and Sprenkle-Hyppolite, 2022). Because carbon sequestration moves odorless, colorless gas that may have no discernible impact for years or decades, certification must be conducted within a recognized and trusted framework. Coherence across standards is essential to ensure the credibility of the carbon removal industry.

While CDR is emerging as an important climate agenda item, other decarbonization options will play a substantial role in reducing 90 percent of net emissions, including zero-carbon energy sources such as renewables and nuclear energy. Transformation toward full decarbonization of energy systems and end use is not only about technology and economics, but also about people, societies, and values and behaviors (Nakicenovic

and Lund, 2021; Nakicenovic, 2022). Design and management of urban areas play important role in achieving decarbonization goals.

**Urbanization: Livability, Sustainability, and Co-Benefits in Copenhagen**

Although SDG 11 (sustainable cities and communities) most directly targets urban areas, cities will not realize the goal of becoming “inclusive, safe, resilient and sustainable” without progress on related SDGs. Many opportunities exist for synergies among SDGs related to urbanization. For example, restoring wetlands and urban forests can bolster food security, provide flood and drought relief, buffer urban heat island effects, and reduce air pollution, as well as providing city dwellers mental and physical relief from stress. Transitioning to low-carbon (including bike-friendly or bus-based) transport systems can not only reduce carbon emissions, but also decrease obesity levels, improve local economies, and reduce air pollution. Decreasing carbon emissions by x per cent or increasing tree cover by y per cent may be possible, but doing so without exacerbating inequity or worsening poverty and vulnerability is more challenging and difficult. To generate sustainable prosperity and improve the quality of life for urban residents, a new development paradigm is required.

Copenhagen aims to become carbon neutral by 2025 and to rebuild with livability linked to sustainability. With an international reputation as a livable, relatively wealthy city, Copenhagen brings to mind images of people bicycling to work and of green spaces and parks, but this environment was not always the case (Leonardsen, 2022). The role of ambitious targets and co-benefits in engaging the population to create a more sustainable, resilient metropolitan area. The key goals in the Copenhagen Climate Action Plan are to reduce energy consumption, reorient energy production to wind and other renewable sources, increase green mobility, and change how the city itself delivers results. Circular Copenhagen (2023) has set specific targets related to recycling, carbon dioxide reduction, and reuse of materials. A Cloudburst Management Plan represents a comprehensive infrastructure effort with more than 300 projects to manage stormwater, as climate change will bring more extreme weather in the future. The plan gives the city an opportunity to consider other issues; for example, water parks that can be used for water storage and recreation. The idea is to take advantage of climate adaptation with co-benefits: recreational value, biodiversity, social resilience, health, improved microclimate, accessibility and safety, and economic growth. Five quality parameters that define urban nature in Copenhagen could be applied in other urban areas: biodiversity, climate adaption, functionality, spatial quality, and maintenance (Leonardsen, 2022).

The importance of collaboration and knowledge-sharing surfaces in almost any discussion about sustainable urbanization. Efforts such as C40, Local2030 Hubs, and SDG Leadership Cities have created and strengthened communities of practice and knowledge-sharing. International organizations could establish and maintain databases for international research on urbanization, such as the Urban Policy Platform (2022) that focus on urban-rural linkages and work of the Organization for Economic Co-operation and Development (OECD, 2021) that strengthens intermediary cities to achieve the SDGs.

## Food Systems: Regenerative Agriculture in Costa Rica

Food system transformation is essential for achieving the SDGs, considering environmental, scientific, economic, and social factors. The current food system is responsible for one-third of global greenhouse gas emissions (Crippa et al., 2021) and 70 percent of global water use (World Bank, 2022). Despite improved agricultural techniques, between 720 and 811 million people in the world went hungry and approximately 2.4 billion people (30 percent of the global population) lacked access to adequately nutritious food in 2020, even before the current rise in global food prices (UN, 2021c) and supply chain disruption. Innovative approaches are needed to engage communities and promote sustainable and equitable food systems.

Regenerative agriculture involves “a system of farming principles that rehabilitates the entire ecosystem and enhances natural resources, rather than depleting them” (Rodale Institute, 2020). Through Regenerate Costa Rica, community farms in Guanacaste, in northwestern Costa Rica, promote regenerative agriculture, including the recovery of biodiversity, holistic livestock, and local education connected to the biological, geographical, and cultural environment. The concept is based on regenerative development, which holistically integrates six fundamental pillars: Mother Earth, Society, Economy, Spirituality, Politics, and Culture (Müller, 2022). Regenerative agriculture can capture large amounts of carbon in the soil, reverse land degradation, reduce the use of fertilizers, retain water, and mitigate climate change through nature-based solutions. The Regenerate Costa Rica initiative is creating a national network to share skills, knowledge, and solutions in collaboration with the Regenerative Communities Network. The carbon sequestration potential of global adoption of regenerative agriculture has been studied (Rodale Institute, 2020), and data, information, and knowledge need to be turned into wisdom and action to protect the planet.

Leaders and planners could be convened to discuss challenges, opportunities, and innovative strategies for sustainable and equitable food systems in the context of the COVID-19 pandemic, geopolitical conflict, and climate change. An example is the Milan Urban Food Policy Pact (2021), an international agreement on urban food policies signed by more than 200 cities from across the globe. There is a need to examine how to transform food systems to achieve critical progress on the SDGs and to contribute to a better future, including reducing inequalities and promoting well-being along economic, environmental, and social dimensions of sustainability.

## Science, Technology, and Innovation for the SDGs: UN STI4SDG Roadmaps

Science, technology, and innovation (STI) are major pillars for accelerating progress toward the SDGs. Partnerships are emerging between city networks and the STI community to serve as intermediary knowledge brokers and catalytic technical advisors to support innovation from the local to global scale. Examples includes the climate action network of megacities known as C40, and other networks in which local governments work collectively to implement shared initiatives. STI is a way to engage youth in development issues and could provide an opportunity to enhance training and capabilities of a technology-savvy workforce in both formal and informal settings.

One promising approach to accelerating the process to meet the SDGs is national development of roadmaps. For example, STI4SDG Roadmaps help a country to build ownership and coherence across its development plans, SDG programs, and STI

initiatives. The UN Interagency Task Team on Science, Technology, and Innovation for the SDGs (IATT) began this pilot project with Ethiopia, Ghana, India, Kenya, and Serbia and continued to scale with the addition of Ukraine. According to a guidebook, the roadmaps have six steps: define objectives and scope; assess the current situation; develop vision, goals, and targets; assess alternative pathways; develop detailed STI for SDGs roadmap; and execute, monitor, evaluate, and update the plan (UN, 2021a). Key inputs include stakeholder consultations, technical and managerial expertise, and data and the evidence base. Lessons from the Roadmap Process include ensuring active participation across government, scientists and engineers, industry, NGO and local community stakeholder groups to develop a coherent vision, goals, and targets (UN, 2021b). Wars and local conflicts may be the greatest threat to achieving the SDGs, as Ethiopia and Ukraine, two of the pilot countries for STI4SDGs Roadmaps, are involved in conflicts that have disrupted their plans for the SDGs.

Governments, the private sector, and nongovernmental organizations could become involved in the efforts at the UN to assist volunteer countries in developing their STI for SDGs roadmaps and to facilitate knowledge exchange and transfer at the local level. Companies could enhance public-private partnerships to support disaster recovery through STI. Philanthropic organizations could highlight and support examples of effective solutions to SDG challenges and sustainability challenges at the local, national, and global levels.

**Conclusions**

As we approach the midpoint to achieve the SDGs, there is an urgent need to accelerate actions for sustainable development. To operationalize sustainable development and address issues relating to decarbonization, urbanization, food systems, and STI for the SDGs, governments, the private sector, and nongovernmental organizations could:

- Work together to explore acceptable levels of uncertainty in certification in both technical and social dimensions of carbon removal and sequestration including intergenerational justice.
- Promote decarbonization in agriculture, industry, and energy production, including by building carbon-neutral cities, strengthening climate education and engagement, and encouraging low-carbon lifestyles for mobility, housing, and consumption.
- Explore the potential impacts of targeted technological innovations on urban and rural agriculture, agribusiness, food supply chain, animal welfare, climate change, energy, water, land use, biodiversity, health, and food loss and waste, as well as societal and cultural barriers they may encounter.
- Become involved in the efforts at the UN to assist volunteer countries in developing their STI for SDGs roadmaps and to facilitate knowledge exchange and transfer at the local level.

Accelerating progress on operationalizing sustainable development involving all levels of government and all sectors of society can be a major steppingstone to realize the optimistic future envisioned by the 17 SDGs. We hope that positive case studies highlighted in this article and our report will guide federal and local policy makers, researchers, practitioners, civil society, educators, business and philanthropic leaders, and other stakeholders in their efforts toward sustainable development.

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